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BULLETIN No. 7.

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DEPARTMENT OF AGRICULTURE

—OF—

BRITISH COLUMBIA.

FLAX.



This bulletin, containing the results of the experiments with Flax, conducted under the auspices of the Department of Agriculture, some of the most approved methods of its cultivation, preparation and other matter, is published by order of the Honourable the Minister of Agriculture for general information.

JAMES R. ANDERSON,

Deputy Minister of Agriculture.

Department of Agriculture,

Victoria, B. C., 22nd August, 1900.

NOTE.—This bulletin, although prepared in 1898, was not authorized to be published until the present year.

REPORT ON FLAX.

The question of the advisability of instituting some experiments in the cultivation of Flax, for the purpose of demonstrating its suitability to the soil and climate of this Province, having been repeatedly urged upon the Government, a supply of seed was obtained in March, 1897, from Messrs. J. & A. Simmers, of Toronto, and distributed amongst one hundred and fifty-seven farmers in all parts of the Province.

The seed was accompanied by the following directions:—

"The Government being desirous of extending the crop products of this Province, and believing that the culture and manufacture of flax products will have a beneficial effect upon the agricultural industry of the country, has procured a supply of the best flax seed obtainable, with a view to its distribution among our farmers for the purpose of making a thorough and extended test as to the suitability of our soil and climate for the profitable culture of this product.

"Farmers receiving a sample of seed are requested to observe the few directions following, viz.:

"Sow the seed broadcast on a clean piece of land, free from weeds, in good tilth and prepared very evenly. The seed to be sown at about the same season as wheat, and covered in with a brush harrow drawn by a man; horses hoofs make deep holes and the seed does not come up evenly.

"The soil should neither be too light nor too heavy, a good alluvial loam is the best. In a very rich soil the fibre grows too coarse. Fresh barn-yard manures are unsuited; should it be necessary to apply any fertilizer, lime, salt and ashes will be as good as can be applied.

"Sow the seed evenly but quite thick on the ground; there should be sufficient to sow three rods of land in the sample sent you.

"If the land be clean the crop will require little or no attention until maturity.

"Farmers engaging in this test will be required to furnish a sample of both the seed and fibre grown, to the Agricultural Department, and to afford all possible information as to practical results, etc, especially on the following points:

- "1. Character of the soil on which the flax was grown.
- "2. Date of sowing.
- "3. Date of pulling.
- "4. Approximate weight of seed and fibre obtained from the seed furnished.
- "5. Have you ever been engaged in the flax industry? If so, what is your opinion as to the results of this experiment?

- "6. How does the quality of the fibre compare with what you have been accustomed to elsewhere? Favourable or otherwise?
- "7. In the event of the manufacture of flax being introduced into the Province, give an estimate of the probable quantity of land in your locality that could be devoted to flax culture.
- "8. Has the season been wet or dry?
- "9. Name and address of person engaging in test."

Whether from indifference or other causes it is impossible to say, but only a very small proportion of those to whom seed was sent made any returns. The following is a list of those who sent available samples, with particulars attached, in those cases where they accompanied the samples:—

No. 1—*Geo. Heatherbell, Hornby Island:*

- (1.) Heavy black clay loam.
- (2.) First week in May.
- (3.) Second week in September.
- (4.) 40 lbs. seed.
- (5.) No.
- (8.) Fine.

No. 2—*J. Seawright, Hornby Island:*

- (1.) Black loam with yellow clay bottom.
- (2.) May 1st, 1897.
- (3.) August 16th, 1897.
- (4.) Seed, 80 lbs.; fibre, 400 lbs. when wilted.
- (5.) Yes, for 40 years. The results of the experiment are, in my opinion, good.
- (6.) The quality of the fibre compares very favourably with that I have been accustomed to, being equal to the best that I have ever seen.
- (7.) There is a great deal of land on Hornby Island that would be suitable for growing flax, if cultivated, but it is impossible for me to say how much would be devoted to that purpose.
- (8.) Season favourable, with occasional showers.

No. 3—*A. D. Faber, Alberni.* (No particulars.)

No. 4—*J. Calbick, Shortreed:*

- (1.) Good soil, a dark loam.
- (2.) May 23rd.
- (3.) July 29th.
- (4.) 50 lbs.
- (5.) No; I think the results are very good.
- (6.) It compares very favourably.
- (8.) Dry.

No. 5—*Wm. M. le Poer Trench, North Saanich.* (No particulars.)

No. 6—*J. Seawright, Hornby Island.* (See No. 2.)

No. 7—*Mrs. Foster, Clinton :*

- (1.) Gravelly.
- (2.) May 12th.
- (3.) October 21st.
- (5.) No.
- (6.) Took prize at Agricultural Fair at New Westminster.
- (7.) 400 acres.
- (8.) Dry; we have to irrigate.

No. 8—*A. E. Reeve, Alberni.* (No particulars.)

No. 9—*J. B. Loney, Elgin.* (No particulars.)

No. 10—*R. F. Elton, Alberni :*

- (1.) Medium clay loam.
- (2.) Last week in April.
- (3.) August 4th.
- (4.) I have not time or means for correctly ascertaining.
- (5.) No experience.
- (6.) No experience.
- (7.) The area would altogether depend upon the cash returns.
- (8.) Very favourably moist.

No. 11—*J. P. Swanson, Shortreed :*

- (1.) Black soil; clay sub-soil; new land.
- (2.) June 15th.
- (3.) August 16th.
- (4.) 425 lbs.
- (5.) I have had great experience in flax-growing and its manufacture in Sweden. Flax can be produced here equal to the best grown in Sweden, and in the event of facilities for manufacture, flax will be a good paying crop.
- (6.) The quality of our flax is excellent; the fibre is of the best.
- (7.) There is upwards of 500 acres of the best kind of land for the production of flax in this neighbourhood.
- (8.) Wet in the growing season, but very favourable for flax culture.

No. 12—*J. C. Mackenzie, Clover Valley.* (No particulars.)

No. 13—*Alex. N. Anderson, Clover Valley :*

- (1.) Clay loam.
- (2.) April 17th.
- (3.) August 27th.
- (4.) 280 lbs.
- (5.) No.
- (6.) Favourable.
- (7.) 200 acres.
- (8.) Medium.

No. 14—Sent by H. T. Thrift. (Grown by someone at Hazelmere; no particulars.)

No. 15—No name, Mud Bay. (No particulars.)

No. 16—Henry Harper, Hazelmere. (No particulars.)

No. 17—Henry T. Thrift, Hazelmere :

(1.) Rich, black soil; heavy clay sub-soil.

(2.) May 12th.

(3.) August 5th.

(4.) 255 lbs.

(5.) I have had experience in this industry. I consider the flax produced this season equal to the best I ever saw.

(6.) Very favourable; excellent.

(7.) I believe Surrey could be depended upon to produce 200 to 250 acres, increasing in quantity according to demand.

(8.) Early part of season very wet; excellent harvesting weather.

Besides the above-mentioned returns, the following reports came to hand unaccompanied, in some instances, by samples, and in others so small or injured that they could not be made use of:—

Gust. A. Warner,
H. Pillar,
H. Bose,
Stanley R. S. Bayne,
Henry Hills,
W. J. Harris,
N. T. Baker,
A. J. Cummings,
Jos. Whelpton,
Wm. P. Emery,

Otter.
French Creek.
Surrey Centre.
Alberni.
"
Port Hammond.
Agassiz.
Salmon Arm.
Agassiz.
Port Renfrew.

The available samples were sent, in the month of March, 1898, to Messrs. Dunbar, McMaster & Co., Ltd., of Gilford, Ireland, accompanied by the request for a report on the quality of the fibre value, and whether best shipped in its natural state or scutched; also the opinion of these gentlemen was asked as to the time of pulling, and other matters in connection with flax growing for fibre.

In due course the following reply was received:—

"J. R. Anderson, Esq.,

"Department of Agriculture,

"Victoria, B. C.:

"GILFORD, Ireland, 23rd March, 1898.

"SIR,—We have safely received the bale of flax-straw samples, advised by your letter of the 17th ult. This flax-straw is all long and well-grown, but

many of the samples have branchy tops, stretching down nearly one-fourth of the total length of the stalk, and some have very coarse roots. These branchy tops and coarse roots do not carry fibre.

"Samples 3, 4, 9, 13 and 14 appear all to be good fibre, and are the best of the collection.

"The next best are 11, 15 and 17, but these have the defects of somewhat branchy tops.

"Samples 2, 12, 10 and 16 are irregular in growth, and some of them have coarse roots which yield but little fibre.

"Sample No. 16 appears to have been damaged—probably owing to being laid to the ground with heavy rain.

"Samples 1, 5, 6, 7 and 8 are all very coarse, with thick, heavy roots, carrying no fibre on them. We think these five samples must have been grown on too heavy, strong soil, and probably the seed was sown too sparsely. Two bushels should be sown to each acre. We think that it would have been better if all your flax samples had been pulled somewhat sooner, as the stalks appear a little too ripe, not quite green enough.

"It would never pay the farmers to ship the flax-straw in its present state, for the cost of carriage would amount to very nearly the whole value of the flax. It takes from five to six tons of dry flax-straw to produce one ton of scutched fibre.

"Without steeping and scutching the samples of flax straw we could not form a very correct opinion as to the value of the fibre which they would produce.

"The eight best samples, if carefully water-retted and scutched, would probably produce fibre worth £40 to £55 a ton.

"Only five of your samples are sufficiently large for us to steep and scutch. When the weather gets a little warmer we shall ret and scutch the flax, and write you again as to the value of each sample.

"Water-retting will make the produce of flax-straw more valuable than grass-retting, but grass-retting is less troublesome and is exclusively followed in the Province of Ontario.

"We have the honour to be,

"Sir,

"Your obedient servants,

"For DUNBAR, McMASTER & Co., LTD.,

"H. D. McMASTER."

To the foregoing letter a reply was sent giving some particulars as to soils, etc., and concluding with the following remarks: "You are probably right about the heavy, strong soil, and as to the seed being sown too sparsely. I had great difficulty to make experimenters understand that it was for fibre the samples were wanted, and that it was therefore necessary to sow the seed thickly."

The final report of Messrs. Dunbar, McMaster & Co., is contained in the following letter:—

"GILFORD, Ireland, 2nd November, 1898.

"J. R. Anderson, Esq.,
"Deputy Minister of Agriculture,
"Victoria, B. C.

"SIR,—Referring to our letter of the 23rd March last, we have pleasure in returning you six of the samples of flax-straw which you sent us, carefully retted and scutched. The other samples were too small to ret and scutch.

"A. N. Anderson's (sample 13) has turned out the best, and would now be worth, here, in its present state, about £56 per ton of 2,240 lbs.

"H. T. Thrift's (sample 17) has turned out the next best, and would be worth about £54 per ton, here.

"J. C. Mackenzie's (sample 12) and H. T. Thrift's (sample 14) would be worth about £50.

"Sample 15, from Mud Bay, would be worth about £48.

"Sample 16, from Henry Harper, would now be worth £40 to £42, as it is very bare and dry, and has little or no spinning quality.

"All these samples have been steeped or retted in water, and then afterwards very carefully scutched.

"Should you desire any more information we shall be pleased to give it.

"We have the honour to be,

"Sir,

"Your obedient servants,

"For DUNBAR, McMASTER & Co., LTD.,

"H. D. McMASTER."

From the foregoing it would appear that the soils of the Municipality of Surrey, in which are situated Clover Valley, Hazelmere and Mud Bay, are without doubt better suited to the production of flax for fibre than the other points from which returns were made. It is possible that this superiority may be due to a better understanding of the required conditions for flax growing, but inasmuch as some of the other growers who reported are experienced cultivators of flax, and that all the best samples came from Surrey, and were grown by different people, the inevitable conclusion must be that it is to the more favourable conditions of the district the superiority must be attributed. The samples from Hornby Island were, in the opinion of many who saw them, very fine, and indeed they were awarded, by some, first place. Mr. Seawright, of that place, in answer to question 5, says he has had 40 years' experience and considers the results good. Nevertheless, the samples are pronounced by Messrs. Dunbar, McMaster & Co., "very coarse and irregular," with thick, heavy roots, carrying no fibre, and the opinion is expressed that they were grown on too heavy, strong soils; and the seed sown too thinly. This opinion is also expressed regarding other samples

grown on Vancouver Island and at Clinton, and of some on the Lower Mainland. I am inclined to believe that the principal cause of coarseness and lack of good fibre is to be attributed to the manner of sowing, viz.: not sowed thickly enough, the short branching stems leading me to this opinion. This was notably the case with the sample from Clinton. In the cases of some of the samples, however, for instance those from Hornby Island and Alberni, I think it is very probable that the heavy, strong soil had as much to do with the coarseness as thin sowing. I form this opinion from the fact that the stalks were of good length and not very branching. The soil from these localities is reported to be a heavy, black loam, with yellow clay subsoil. Be this as it may, the fact remains that Surrey carries the palm from amongst those localities whence returns were obtained; and if, in the future, the cultivation of flax is to be attempted in other parts, more attention must be paid to the conditions imposed for growing good fibre.

According to statistics, the yield of flax for twenty-four years, from 1853 to 1876, inclusive, in Ireland, averaged 387 lbs. per acre; the largest yield for any single year being 563 lbs., and the smallest 185 lbs. In Ontario the yield, as given by Bulletin 25, Central Experimental Farm, averages 3,000 to 3,500 lbs. of straw per acre; this would give, according to Dunbar, McMaster & Co., from 500 to 700 lbs. of scutched fibre. According to another authority, the yield in Ireland is given at 200 to 240 lbs. of dressed flax from a bushel of seed, and as much as 320 lbs. have been known to be got on very rich land; and since 2 to $2\frac{1}{2}$ bushels per acre are sowed, the figures would represent from 400 to 500 lbs. the lowest, 480 to 600 lbs. middling, and 640 to 800 lbs. highest. There seems to be a considerable discrepancy in the figures just quoted; not so much so in the Ontario yields and the last quoted yields in Ireland, as between those figures and the average for the twenty-four years first above quoted. This may possibly be partly accounted for by the fact that the average for twenty-four years is taken from figures furnished by the Registrar-General and published in *Encyclopedia Britannica*, Vol. IX., and are possibly placed very low for special reasons. On the other hand the average yields, by the same authority, for fourteen other countries where flax is cultivated for its fibre, range from 488 lbs. to 254 lbs. per acre; however, the same reasons may have influenced the returns in those cases also. I have no means of estimating what the yield would be in this country as I have no data to go upon, but taking the highest yield in Ontario, viz.: 700 lbs. of scutched flax per acre, at the price placed upon the best sample submitted to Messrs. Dunbar, McMaster & Co., viz.: £56 per ton, or about $12\frac{1}{4}$ cents per lb., would give \$85.75 per acre; the lowest yield in Ontario, viz.: 505 lbs., at the same price, gives \$61.25 per acre. The price placed upon the poorest sample by the same people is £42 per ton, or approximately $9\frac{1}{4}$ cents per lb.; this would give \$64.75 per acre for 700 lbs., and \$46.25 per acre for 500 lbs. Now, say, for the sake of ascertaining how a producer would come out after having planted, harvested, cured and packed his fibre,—

Proceeds of 2,240 lbs. flax in London, £56 at \$4.85.....\$271 60

Charges.

*Local transportation charges (if any), \$1 per ton of 40 feet.	1 78
Wharfage (if any), 50 cents per ton of 40 feet	89
Freight per ton of 40 feet—2,240 lbs. = 71 feet at 35/	15 06
Port charges at London, 4/ per ton of 40 feet	1 72
Commission, 5 per cent. on \$271.60	13 58
Insurance from Fraser River, 2 per cent. on \$271.60 + 10 per cent. on \$298.76	5 97
Interest, 6 months, 8 per cent. per annum	10 86
	<hr/> \$ 49 86

* Estimated that a bale of flax measuring 6 feet 4 inches weighs 200 pounds, therefore 2,240 pounds would measure 71 feet.

Leaving net proceeds of \$221.74 per ton, or a little under 10 cents per pound, to pay for cost of production—say, seed, preparing land, sowing, weeding, pulling, retting or grassing, scutching and baling. According to a reprint from the Irish Textile Journal, the cost of production per acre in Ireland, including the items above mentioned, except baling, but including rent and taxes for seven different returns, runs from £6 15s. 9d. to £9 12s. per acre, or an average of £8 8s. 8d. It will be observed that there is a considerable difference between the lowest and the highest figures. This is partly accounted for by the difficulty in obtaining actual figures in all cases, and, furthermore, the remark is made: "Taking, however, such figures as are available they will provide a working guide to intending growers. A distinction must be observed between the incidence of hired labour and the small farmer working for his own benefit and paying no wages. In the one case something over and above wages must be realised; in the other case if a fair amount over the outlay remains when all other claims, exclusive of wages, are met, it may stand as profit, although it might not make both ends meet if all the labour supplied by the farmer's family had to be paid for in cash. This distinction must be kept in mind, or it would be impossible to account for the fact of flax being cultivated when, according to the scale laid down, the margin for profit had almost vanished."

In any case I think we may safely admit that the cost of production in this country will be at least as large as the greatest of the seven above-quoted lists of expenditure; hence £9 12s., or \$46.56, per acre is taken as the cost of production in this country. As above stated, the net proceeds per pound, according to the highest price quoted by Dunbar, McMaster & Co., is under 10 cents per pound—say 10 cents per pound—or from \$50 to \$70 per acre, taking the production per acre in Ontario, which is placed considerably higher than that of any of the European averages. It will thus be seen that admitting everything in its favour, the highest production and the highest price, the profit to the producer would be but \$23.44 per acre, and taking

the lower production of 500 pounds per acre, the profits would about reach the vanishing point even at the highest price.

Presuming, therefore, that the figures given are approximately correct, the outlook for the cultivation of flax for fibre alone in this Province is not flattering. There is, however, the seed to be considered, for a certain amount of seed is always available, even when its production is but a secondary consideration. The average yield of seed in Ontario for 1895 is given at from eight to nine bushels per acre, and the weight of the straw averaged 3,000 pounds. The United States are the principal customers for the seed, where the price ranges from 90 cents to \$1 per bushel, which, deducting a duty of 20 cents per bushel, reduces it to 70 or 80 cents, and the transportation charges possibly another ten cents. This would give, possibly, another \$5 or \$6 per acre. Probably the figures given are erroneous to a certain degree; it is a difficult matter to give exact data, but I have endeavoured to place them in as truthful a light as possible, so that no one may be misled.

In Manitoba and the North-West United States flax is grown exclusively for seed. This is rendered possible by reason of the large extent of available land which is easily put under cultivation, and not because it is the most profitable product of flax, as it is the fibre that gives flax its greatest value, but because it has been found impossible to grow good fibre on account of the climate, and hence oil mills have been erected in Manitoba. In this country, however, the production of seed must, I believe, in the nature of things, always remain of secondary importance, so that even if the cultivation of flax for fibre were undertaken comparatively extensively, the production of seed would probably be too limited to warrant the erection of oil mills, and therefore seed could only be made available by being sold to manufacturers of oil and oil cake in other places.

It is the usually accepted belief that flax is a very exhausting crop to the soil; this does not seem to be the case, in as far as the plant itself requiring more plant food than many other plants; but it is a fact that it requires more assimilable food for immediate use than many other plants, for although its root system is a delicate one it is a quick grower, and takes up all the available plant food within reach required for its sustenance. Hence it is of the utmost importance that a systematic and judicious rotation of crops should be observed on land where flax is produced, and, one of the requirements for the production of good flax being a soil free of weeds, many authorities recommend a hoed crop to immediately precede the flax. Thus one of the rotations recommended by the Irish Textile Journal is oats, turnips, wheat, clover, and grass, oats, potatoes, flax. The Oregon Station, which has given considerable attention to flax growing for fibre, recommends the following rotation:—First, wheat; second, oats and barley; third and fourth clover and grasses; fifth, corn and potatoes; sixth, flax. "The object of the cultivated crops in the rotation is to clean the ground of weeds, and by placing such crops just preceding flax this will be better obtained than when they occur earlier in the course."

As regards the exhausting nature of flax, the following, which I take from the United States Farmers' Bulletin 69, goes to prove that it does not take as much fertility from the soil as is generally supposed:—

"Attempts to grow flax in the United States have been most successful on the fertile virgin soils of the North-West. In fact, at the present time practically the entire flax crop of the United States is grown west of the Mississippi River. The fact that flax has been successfully grown only on such fertile soils has led to the quite general belief that this crop makes a heavy draft on the fertility of the soil.

"The Minnesota Station has recently made some investigations which throw considerable light on this point. Flax plants were analyzed at different stages of growth, and studies were also made of different soils on which flax had been grown with varying degrees of success. From the analyses of the flax crop, as well as of other crops ordinarily grown in the same region, the table (following) showing the approximate amounts of plant food removed by average yields of these crops has been prepared. This table shows that many of the crops ordinarily grown remove more plant food from the soil than the average flax crop. This is strikingly true in the case of corn. The oat crop removes about the same amount of nitrogen and phosphoric acid, but nearly as much again of potash as the flax crop. The necessity for a fertile soil in successful flax growing is not due, therefore, to the fact that this crop requires larger total amounts of fertilizing constituents than other common farm crops, but to the fact that although it is a somewhat dainty feeder with a small root system, it must secure the necessary plant food for its perfect growth in the short growing period of from sixty to one hundred days. The plant food, therefore, must not simply be abundant, but it must be in a readily available form.

"PLANT FOOD PER ACRE REMOVED BY VARIOUS FARM CROPS.

Crops.	Weight per acre. Pounds.	Nitrogen. Pounds.	Phosphoric Acid. Pounds.	Potash. Pounds.	Lime. Pounds.
Wheat, 20 bushels	1,200	25	12.5	7	1
Straw.....	2,000	10	7.5	28	7
Total.....		35	20	35	8
Barley, 40 bushels	1,920	28	15	8	1
Straw.....	3,000	12	5	30	8
Total.....		40	20	38	9
Oats, 50 bushels	1,600	35	12	10	1.5
Straw	3,000	15	6	35	9.5
Total.....		50	18	45	11
Corn, 65 bushels.....	2,200	40	18	15	1
Stalks	3,000	35	2	45	11
Total.....		75	20	60	12
Peas, 30 bushels	1,800		18	22	4
Straw.....	3,500		7	33	71
Total.....			25	60	75
Mangel-wurzels, 10 tons	20,000	75	35	150	30
Meadow hay, 1 ton.....	2,000	30	20	45	12
Red clover hay, 2 tons.....	4,000		28	66	75
Potatoes, 150 bushels	9,000	40	20	75	25
Flaxseed, 15 bushels.....	900	39	15	6	3
Straw	1,800	15	3	19	13
Total.....		54	18	27	16

"The table shows, further, that the heaviest draft in flax culture is made upon the nitrogen of the soil, and this fact, taken in connection with the further fact that nitrogen is more abundant in virgin soils than in those which have been cultivated, explains the greater success of flax culture on new land. It furnishes, also, a strong reason why clover should be included in the rotation with flax.

"The same station has also undertaken to determine the reason why flax cannot be grown continuously on the same soil. Experiments on this sub-

ject show that the flax-straw and roots in their decomposition produce products which will destroy the following flax crops. When five or seven years intervene between two flax crops, then the old straw and crop residue is thoroughly decomposed and will not injure a new flax crop. Unless new land is available, therefore, it becomes necessary to grow flax in rotation with other crops."

A short explanation of the terms used and a description of the methods of cultivation of flax and process of preparing it for market is here given, and is taken from the reprint of the Irish Textile Journal, Bulletin 25, Central Experimental Farm, and from prize essay by S. Edwards Todd.

Preparation of Soil.

The preparation of the soil must be very carefully attended to, and the greatest trouble taken in this respect will be amply repaid. Weeds allowed to grow up with the flax greatly interfere with the subsequent handling and scutching, and lower its value, so that the duty of having the ground very clean and free of weeds must be kept in view from the beginning, as well as at every stage of the preparation. After potatoes or wheat, one ploughing on light or medium lands will be sufficient, and this is recommended to be deferred till early spring; but in heavy soils two ploughings are necessary—one, pretty deep, in the autumn, and the other, well, before sowing time comes round, but not so deep. Three ploughings are seldom resorted to, though on stiff, heavy soils they may be required; but, as remarked before, no expense should be spared to secure the best results. Harrowing will be very essential; but independent of that, before sowing time, it will be beneficial to have all weeds removed (which can be done by children or adults when necessary) and the soil left perfectly clean. After the last harrowing, rolling precedes the sowing; but there is some difference of opinion as to whether it is better to deposit the seed on the rolled surface, or have it gently broken up to receive the seed. We are inclined to think that the rolled surface is best, and for this reason, that there is less chance of seed getting buried or covered to a depth which might prevent vegetation; much good seed of all kinds is often lost in this way, to the detriment of flax-growing and the discredit of the seedsman or vendor, when the blame justly lies at the door of mismanagement. Both systems have doubtless succeeded or they would not have been recommended, and we would be slow to condemn either. Demoor, writing on this point, says:—"In agriculture, as much, if not more, than in any other industry, it is necessary to use a wise caution, and we ought also to break away from the dominion of prejudice or bias.

"Seed.

"If flax is grown simply for seed, a carefully-selected home-grown seed may be used, but for the production of fibre imported seed is necessary.

"In the selecting of the seed for sowing also see that it is free from weed seeds, and the heaviest, brightest and plumpest samples of seed should be

preferred. As flax grown for fibre undergoes more or less deterioration each year, the proprietors of flax mills usually import some fresh seed every season from Belgium, Holland or Russia for distribution amongst their patrons. It is said that the seed is at its best the second year from importation."

Sowing.

"Every practical man knows that flax seed is very slippery grain to sow by hand. Consequently, unless a man take great care, the seed will be sowed very unevenly. As it is so very slippery it is not practicable to sow it with a grain drill, nor with any kind of broadcast seed sower that we have ever met with. The details of my own practice, which I have never before put on paper, are as follows:—After the soil has been harrowed as directed above, mark out the ground two ways, in lands about 18 feet wide. This breadth is wide enough to sow at one round or two casts. Let the seed be soaked in warm water about two or three hours, and then rolled in plaster or gypsum. Then make calculation to sow the required quantity of seed on each land each way. Take as much seed as you can conveniently hold with one thumb and three fingers. If you are liable to take too much seed, hold a small round stone in the hand while sowing. The object of rolling the seed in gypsum is to render it less slippery. I can always scatter the seed much more evenly by sowing a few rods wide all one way, instead of going directly back and forth. This I do by going around a land about five or six rods in width, as in ploughing. The best way to mark out flax ground is to drag a log chain behind you across the field from one stake to another. It will pay well to carry out all these practical details in full. As flax seed is much more difficult to sow than most other kinds of seed, it is very important that none but an experienced sower—one able to move with a very steady and uniform gait, and to cast every handful with the accuracy of machinery—should be employed to sow flax seed. If the ground be marked out the sower can always see where his seed falls. But when he sows by means of stakes a deviation of only a few inches to the right or left will drop the seed too thin in some places and too thick in others. The sower should always set a small stake where he commences to sow, at both ends of the plot, so that he will be sure that no strip will anywhere be sowed too thick or too thin. Two to two bushels and a half per acre should be sown for fibre.

"Covering the Seed.

"I never would allow a team of any kind to pass over the field, after the seed has been sowed, for the following reasons: If the soil is at all light and porous, a team will, with their feet, bury much of the seed so deeply that it will be several days behind, and never be able to attain an equal growth with the rest of the field. Another reason is, when the seed is buried so deep, the flax will pull much harder. Flax seed requires but little earth to cover it deep enough to vegetate in a short time, and by depositing it all

on a smooth surface, where several seeds will not be gathered into depressions in the soil, it will all vegetate alike, will stand evenly on the ground and pull easily; may be cut with scythes, cradles or horse-mowers close to the ground, and the straw and lint will be of a uniform length and quality. My practice has been to 'bush in' the seed by drawing a brush harrow behind. With a suitable brush, one man can bush in four or five acres per day, and do the work well. Such a harrow covers a strip about five feet wide, and an active man or a strong boy can cover the seed nearly as fast as he could do it with a team, and much better.

"Weeding.

"If the soil has been prepared and the seed put in at the time and in the manner directed in the foregoing paragraphs very little weeding will be required; but if Canada thistles, dock, wild mustard or other noxious weeds should show their heads, let a careful man, shod with two or three pairs of old woollen socks, remove them when the flax is eight or ten inches high. A lot of boys or heedless men should never be allowed to go among flax, unless when it is very young, because if it is trodden down after it has grown a foot or more in height, most of it will never recover its erect position. The object of covering the feet with something soft is that the plants may be injured as little as possible. Hard boots and shoes will crush the stems so badly that even if they should straighten up again there would be a bad spot in the fibre. The weeds should be cut off close to the surface of the ground, gathered in the arms and carried to a pile—not thrown down. If pulled up, much of the flax will be rooted up with them. In some parts of the old world men, women, girls and boys do the weeding, when the flax is only a few inches high; they sit flat on the young flax, hitch along, and weed on each side of them as far as they can reach. It is better to destroy the weeds before the seed is sowed, and keep everything off the young flax.

"When to Pull.

"As the time of ripening approaches, the observing farmer will appreciate more than at any previous period the importance of the details heretofore given. When the seed has been harrowed in and buried deep by the feet of teams the flax will ripen very unevenly, and a portion of it will be very green, while the remainder will appear fully ripe. Under such circumstances it will be necessary to estimate what proportion of the heads are fully ripe, and how large a proportion are still too green to be pulled. When the bolls have assumed a brown colour, and the leaves have died for one-fourth the length of the stems at the lower ends and the stems themselves have changed from a dark green to a light yellowish colour, then the flax is fit to pull or to cut. At this stage of growth it will yield more and better fibre than if cut at any other period. If it is too green when pulled, there will be a great loss both in quality and quantity. If the seed be put in as directed almost all the bolls and stems will ripen uniformly, and it will be very easy to decide

as to the best time for pulling or cutting without incurring any loss. When a man has a number of acres of flax to be pulled he should not wait until it is all ready before he commences, lest much of it become too ripe. Should the soil be variable in its character the flax will ripen unevenly and the ripest portions may be pulled first. When flax is allowed to stand until it is dead ripe, the seed will be of superior quality, but the fibre will not be so heavy, strong or soft.

"Pulling.

"When flax is pulled by hand, each labourer takes a strip about four feet wide, and either spreads it in a swath behind him or throws it down in gravels, or binds it himself as fast as he pulls it. The flax is grasped just below the bolls, with both hands, and pulled up with a sudden jerk. If it is pulled slowly, a much larger quantity of earth will adhere. As soon as one handful is pulled it is set on the ground close to the standing flax, and held with one hand while the other gathers as much as can be gathered conveniently; then both hands grasp the whole and pull. When enough has been pulled to make a gravel as large as the puller can grasp with both hands, which will make a bundle about five inches in diameter, it is 'butted' once or twice on the ground to even it. Any scattering stalks standing or lying on the ground are gathered for bands, and the gravels are bound at once. This mode is usually adopted in preference to spreading in swaths. If the weather be wet and lowery, it will be better, at any rate, to bind the flax as fast as pulled, and to set the gravels in long stooks (as shown in figure). These should always be set up north and south, so that the sun may shine on both sides of the stook in the course of the day. Before the gravel leaves the hand of the puller he should strike it once or twice on the ground, or on his foot, to knock off the dirt. If the weather is pleasant, it is always better to spread out each gravel, as it is pulled, about one inch thick for the purpose of sunning it. After it has lain in the sun from half a day to a day it ought to be turned over to sun both sides. An expert puller will throw every gravel down in such a manner that they may be readily gathered when cured enough to be bound up. As flax will hang together if in a continuous swath, it is better to leave a space of two or three inches between the spread gravels, and sometimes they are laid alternately, heads and butts. This is important, so that they may be each turned over readily or taken up and bound, without tangling. When it is bound as soon as pulled, and set in stooks, it will require from one to two weeks to cure before it will be fit to stack or mow. When it is bound as fast as it is pulled the outside of the flax will, in a very few days, all appear sufficiently cured to be stacked, while much of the middle of the bundles will be too green. It is quite as important to cure all the stalks and seed bolls thoroughly before packing as to cure hay or any kind of grain. The question is frequently asked, why is it not as well to cut flax as to pull it? The fibres of flax diminish in size, tapering from a few inches above the root

until they run entirely out at the root of the plant. It will therefore run much smoother when spun, and will form a cleaner and smoother thread if pulled than if the fibre is cut in two. If stalks can be cut within an inch of the root nearly the entire length of the fibre will be secured, as well as part of the advantage of this tapering of the fibre. In some parts of our country dealers make a difference in the price between 'reaper cut' and pulled flax.

"Rippling and Saving of Seed.

"Hitherto, the general custom in Ireland has been to pay no attention to the seed, which has been a great mistake, as by a judicious management a large amount could be saved without prejudice to the fibre. The custom of steeping immediately after pulling is unfavourable to saving well-matured seed, but for feeding or crushing purposes the seed may be sufficiently advanced without injury to the quality of the flax. For good sowing seed, the system of drying in the field and holding over the straw with the seed on till the following year is to be commended; but seed can be saved for sowing on the Irish system, because much of it would, with a little more care, be suitable for the purpose. The aim should be at least to have a large quantity of seed in a marketable condition for the mills engaged in crushing for the extraction of oil, etc., and whatever falls short of this could be utilized for home feeding on the farm.

"If the saving of the seed be determined upon, the routine at the pulling must be altered accordingly. Instead of being made up in beets ready for the dams, the handfulls as pulled are laid across each other in a convenient way for the rippers, and afterwards the straw can be tied up in sheaves ready for steeping. The rippling is simply a combing process, but the comb is of large dimensions and a fixture, having the teeth pointed upwards. The tops of the flax only, which bear the little round capsules containing the seeds, are drawn through the ripple, which pulls off the seed bolls completely. A minute description is unnecessary; ripples can be bought at any foundry or machine shop, though a description may be of some interest and can be referred to when required. The teeth can be made of half-inch iron bars, 12 to 15 inches long, and set into the stock about one-quarter of an inch apart, twenty-four teeth being sufficient to make a ripple about 18 inches long. These teeth are tapered to a blunt point about one-fourth of their length, and through this rough hackle the heads of the flax are drawn till the seed and the useless branches are removed. A tarpaulin or a winnowing sheet should be spread beneath the bench to receive the bolls as they fall, or they can be swept up off the ground without much loss. It is hardly necessary to add that the seed will not keep safely in the green state, but must be dried like any other seed. If spread in the open air it dries quickly, but in wet weather it must be spread indoors. The seed, when sufficiently dried, is cleaned through sieves or riddles of the proper mesh, but common sense must supersede detailed directions for the proper carrying out of the

many little contrivances to save labour and promote economy in time and wages. After rippling, the flax is conveyed to the dams and treated as already described.

"Rotting.

After the seed has been separated the stalks are passed into the hands of the manufacturer, whose business it is to prepare the fibre for the market by rotting and dressing it. If the producer desires to perform a portion of this labour himself he should understand what to do and how to do the work. The stalk straw or haulm of flax consists of two parts—the fibre or inner bark, and the shives or woody interior portion, and which is also frequently called shoove, shove, boon, and hurl. The fibre adheres firmly to the stalk by means of a glutinous substance, and the object of rotting the stalks is to dissolve and decompose the mucilage which holds the fibre and woody parts so firmly together; and when properly rotted the shives will separate from the fibre as readily as bark will peel from a young willow sprout in early summer. There are two ways of rotting flax, preparatory to dressing it. One is called aerial rotting and the other water rotting or steeping."

"Aerial or Dew Rotting.

"This is accomplished by spreading the flax on a smooth grass plot in long straight swaths, about half an inch thick. A spreader goes before the man who spreads the flax, and divides the bundles into handfuls, throwing them down where the swath is to be made. The spreader either bends his body forward or squats down with the tops of the stalks towards him, and with a quick motion spreads the handfuls as fast as they can be thrown to him. There are only two things to be observed when spreading flax, which are to keep the butts even, and to spread it of a uniform thickness. Some spread the swaths so closely that they touch each other, but I always prefer to leave a space of a few inches between to prevent the tops of one being tangled with another. After it has lain a week or ten days it should all be turned upside down by running a long, slim twenty-foot pole beneath the swath, near the top ends of the flax, and let a man and a boy turn over a section of about twenty feet at once. I have always found that two would perform this part of the work better than one could do it with a short pole, because every time a portion of a swath is raised, unless some one stands on the swath where the separation is made, it will be more or less tangled. The length of time required for rotting will depend entirely on the state of the weather. If alternate rains and sunshine prevail, two, three or four weeks will be sufficient. The length of time that flax has been spread must never be relied on as a correct guide for determining whether or not it is rotted enough. There are certain rules which all experienced flax growers understand which will enable a beginner to determine when it is sufficiently rotted. The most reliable rule is, the stalks, if bent with the fingers, when dry, will snap like pieces of glass, and the shives separate freely from the fibre. Beginners

should watch their flax every day and apply this test, lest it be rotted too much, causing a great waste of good fibre. When rotted too much the fibre will separate from the shives at the junction of the main stem and branches and sometimes the fibre of the main stems will separate from the shrive, and portions of the stem will be seen in the form of an Indian's bow when adjusted for the arrow. It needs a little experience to determine the point at which flax is sufficiently rotted.

"Steeping or Water Rotting.

"The true way of rotting flax is to steep it in water. In dew rotting, if the weather be ever so favourable, a good proportion will be rotted too much if it be kept on the ground until all the stalks are rotted enough; but when steeped or water rotted there is greater uniformity in the process. If it is kept in the water just long enough it will be all rotted alike, and be done very much better than it can possibly be by dew rotting. Moreover, flax can be rotted much sooner by steeping than by dew rotting, the object being simply to dissolve the mucilage that holds the fibre and woody parts together, so that they will separate readily as soon as the flax has been dried. Prepare a pond of water in the same way as a mill pond, with a waste gate to let the water off at pleasure. A suitable place can be prepared on almost every farm at a trifling expense. The bundles are held in an erect position a few inches from the ground, so that the water may pass both beneath and above them. For this purpose a platform may be made of rails or boards, and fastened down with stones or stakes. Then set up the bundles and drive down stakes, and nail strips of boards from one to the other over the tops of the bundles to keep them from rising out of the water, which covers the flax a few inches. Then shut the waste gate and let the pond fill. Sometimes a crate is made and launched on a mill pond and the bundles secured in it, when it is floated into deep water and sunk sufficiently with stones placed on the crate. Soft rain water is superior to spring water for rotting. While it is in the water a partial fermentation commences, which must be arrested at the proper time, or the fibre will be damaged in proportion to the degree of fermentation beyond the proper state.

When to remove from the Steep.

"As the process of fermentation will progress very slowly in cool weather, and rapidly in warm, it is impossible to state any definite period of time for keeping it in the water. If the water be of the correct temperature the process of rotting will be completed in six or seven days. The cooler the water the longer the flax will be in rotting. After it has been steeping about five days it should be examined carefully every day for the purpose of ascertaining when it is rotted just enough. Pull a few stalks from different bundles in several places, break them into pieces a few inches long, and pull out the shrives. If they separate very freely from the fibre the water should be let

off without delay, and the flax spread out on clean grass to dry; when dry enough it should be bound in large bundles and housed.

"Scutching.

"This operation finally separates the woody part of the plant from the fibre, and, in the common use of the term, is included the preparatory process of breaking, *i. e.*, a thorough bruising which the straw undergoes to loosen the flax on the core or shove, and render the whole plant pliant enough to lie on the stock in the beating process, or scutching proper, which completes the cleaning.

"In primitive times both processes were carried on solely by hand labour. A large smooth stone and a mallet or beetle answered for breaking, and a wooden blade—or scutching handle as it was sometimes called—served the purpose of scutching, the flax being held in the left hand over the end of an upright board called the stock, and beaten with the scutching handle held in the right hand. A large quantity of flax is still prepared in this way in Ireland and elsewhere, and the custom may linger, like many others, for generations in very backward districts; but machinery must supersede all forms of hand labour where the work to be accomplished is of sufficient magnitude, and it is a questionable policy to assist in any degree to stereotype or perpetuate a custom which has no real advantages to recommend it. Hand scutching as an employment is, from an economic point of view, not many degrees above pure idleness, and it would be a false step to increase labour in a shape essentially unproductive and barren of good results; but there is no rule without an exception, and hand scutching may be practised under certain limited conditions. Occasionally flax is too short for mill scutching, or long and short flax may be mixed, the result of uneven growth or careless pulling, and as at times all too short straw would nearly all be lost, hand scutching, as a last resort, may be necessary, but the price of such flax being lower than mill scutching is only under such conditions as mentioned that it should be preferred.

General Remarks.

I will conclude with the following quotations bearing on the general aspect of flax as a farm crop.

One of the best Irish writers on agriculture said:—"Flax is a hazardous crop, and on this account its cultivation cannot be regarded as on the increase. In the market price there is also great variation, being sometimes very high, and at others so low that it cannot be regarded as remunerative." Let this writer wisely add, by way of qualifying his remarks, that if the sowing of the seed were properly attended to, so as to combine the profits of the seed with that of the fibre, the cultivation of flax would be better deserving of encouragement than it is at present, as it would then be more remunerative to the cultivator.

I think there can be no doubt that the other products requiring less manual labour have had much to do with driving flax from the list of ordinary farm crops. Its demand on labour is such as to seriously interfere with the general routine of the farm, and while products less exacting in this respect can be found to take its place, no doubt they will receive the first consideration. The flax crop should, however, find a place in the ordinary farm rotation and an outlet will then be found for constant employment; with the aid of labour-saving appliances it will, no doubt, receive that attention which its merits entitle it to.

Flax is probably the most important of these crops (referring to other crops). Indeed from the rapid growth of our linen trade, the growing demand for linseed and its products, and the fitness of the climate and soil for the successful growth of flax, it is not without cause that its more extended cultivation has been so strenuously urged upon our farmers, and that influential societies have been organised for the express purpose of promoting this object. Viewed merely as an agricultural crop, the cultivation of flax is exceedingly simple, and could be practised as readily and extensively as that of the cereal crops. The difficulty is that before it can be disposed of to any advantage it must undergo a process of partial manufacture; thus there is required not only an abundant supply of cheap labour, but such an amount of skill and personal superintendence on the part of the farmer as is incompatible with due attention to corn and cattle husbandry. If a ready and remunerative market were available for the fibre in its simple form of flax straw, this, in combination with the value of the seed for cattle feeding, would at once hold out sufficient motive to our farmers to grow it statedly and to any required extent. Until this is the case its culture cannot extend in the corn-growing districts of Great Britain. In Ireland and parts of the Highlands of Scotland, where there is a redundant population much in want of such employment as the flax crop furnishes, and where the climate is suited for its growth, it is highly desirable that its culture should extend, and probable that it will do so.

J. R. ANDERSON,
Deputy Minister of Agriculture.

*Department of Agriculture,
Victoria, B. C., August, 1898.*

VICTORIA, B.C.:

Printed by RICHARD WOLFENDEN, Printer to the King's Most Excellent Majesty.
1901.

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